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EXPERIMENT STATION
PORTLAND, OREGON

UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

SUMMARY
of
THE TILLAMOOK BURN STUDY 1942-43
U. S. Forest Service -- Region 6
April 1944



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T H E B U R N

FOREWORD

Late in 1941, at the request of the Tillamook County Court and the Tillamook Chamber of Commerce, the Forest Service agreed to undertake a comprehensive study of the Tillamook Burn area, its present condition and the possibilities for further salvage and future rehabilitation. Shortage of staff personnel and the pressure of war activities assigned to the Service combined to retard progress on the study. However, both field and office work were actively carried on through 1942 and preliminary field surveys were finished in December of that year. The results of the work and conclusions drawn therefrom were incorporated in a preliminary report completed by the Forest Service in June 1943.

The report was presented to the Tillamook County Court on August 18, 1943. It was reviewed with members of the County Court, the Tillamook Chamber of Commerce, the State Forester, the State Budget Director and others on January 26, 1944.

Needless to say, the work done so far, though it has been difficult and time consuming, actually represents only a start toward solution of the entire problem. The Burn in its present condition is a challenge to man's ingenuity. The study to date comprises only a preliminary survey of the area, together with the costs and methods of rehabilitation. It leaves much work to be done in the office and in the field--much fact finding, technical and economic research, and finally, detailed decision and a carefully thought out, properly balanced plan of action in all of its phases to insure success in attaining the objectives set up.

One way to handle the burn is to continue indefinitely the policies and protective measures which have been in effect since 1933. These protective measures are admittedly inadequate, and will not result in the return of the burn to a productive condition for an unpredictably long period. Obviously a new approach to the Tillamook burn problem is badly needed. The simplest approach is to regard the entire burn as beyond justifiable human effort, to surround it with a super-fireline and let nature take its course, whether it takes 100 or 300 years to grow a new forest. While such an approach is extremely pessimistic it is much sounder than a continuance of protection expenditures at the present level.

A second approach might be termed the "public work relief" method under which it is presumed that the Burn should be restored to a productive condition as soon as possible and that the job should be done as a public work measure. The Forest Service preliminary study indicated the cost and scope of such an approach; namely, about \$20,000,000 or an average expenditure of \$43.00 per acre.

From a critical study of the preliminary report the possibility for a third logical and practical approach has been developed.

Under this approach two additional factors which would tend to reduce costs or increase benefits of the project should be analyzed and coordinated. The basic premise of the preliminary study, which is that no significant rehabilitation work is justified on the burn area until an adequate fire protection setup is provided, is maintained. However, the possibilities for dividing the burn into compartments so that intensive fire protection measures could be installed in a progressive manner should be studied. Second, possibilities for reducing hazard reduction cost and increasing local employment from intensive salvage of fire-killed timber should be carefully analyzed. A transportation system should be designed to serve so far as practicable the dual purpose of fire protection and utilization. It would appear sound to subsidize salvage operations so long as the subsidy costs do not exceed those of snag falling and burning. A study of manufacturing and marketing methods for the fire-killed timber is an important phase of salvage investigation.

The original report of 1943 included considerable technical data. It was thought a brief summary of its important points together with some discussion of the additional factors above mentioned was needed.

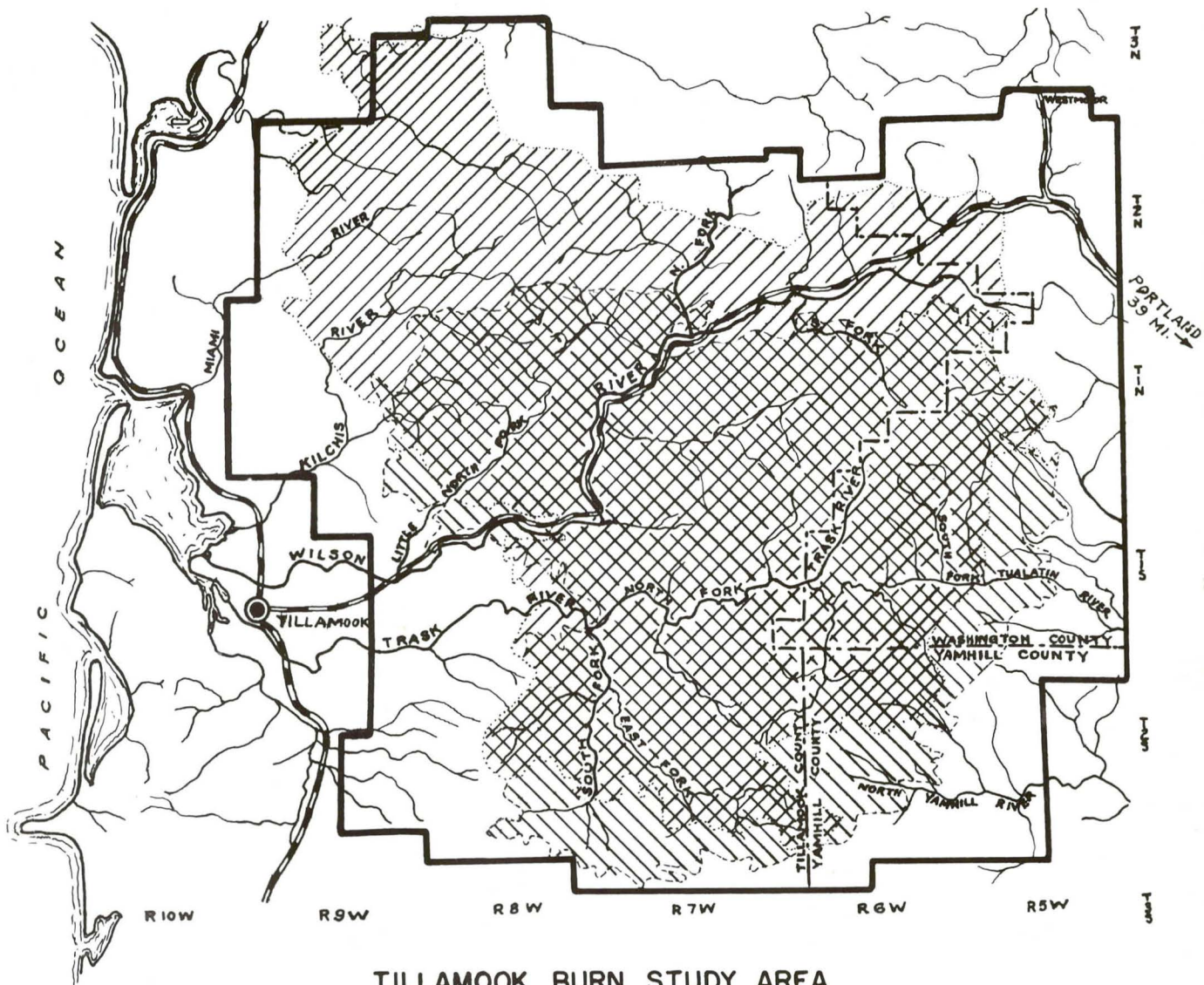
The following report, then, is a summary of the original 1943 report with the addition of some material on salvage possibilities and an outline of the action program recommended not only to salvage further material but also to rehabilitate the Burn, and promote community stability within the counties affected. It necessarily omits much detail, but does retain the basic information on which the salvage and rehabilitation programs can be projected. It is being made available at this time as a working tool for this purpose in order to stimulate constructive discussion of the problem and action leading toward its solution.

The Forest Service, with the limited personnel facilities at hand during wartime, is looking into the broad aspects of salvage. The State Forester and the Forest Service have agreed to get together for the purpose of harmonizing as much as possible their tentative plans for protection improvements, placement of protection personnel, and other preliminary engineering phases of the work.

Even though explorations into the salvage field might show possibilities of lessening the cost of reducing the snag hazard, the cost of rehabilitating the area within two or three decades will be large. The preliminary report and the following revision of the preliminary report have not covered the problem of jurisdiction. Under any plan adopted the agency or agencies assuming responsibility for rehabilitation will have to spend heavily for many years and it will be a long time before returns are available. More than likely it will be found desirable for the State and the Federal Government to join efforts if this job is to be accomplished. Title to the

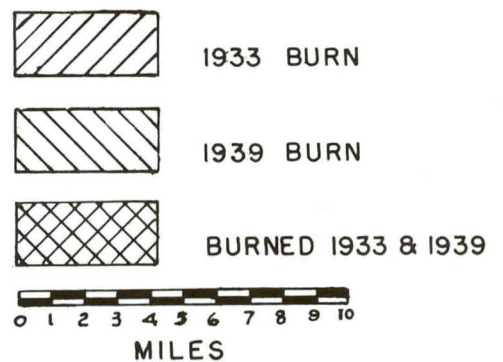
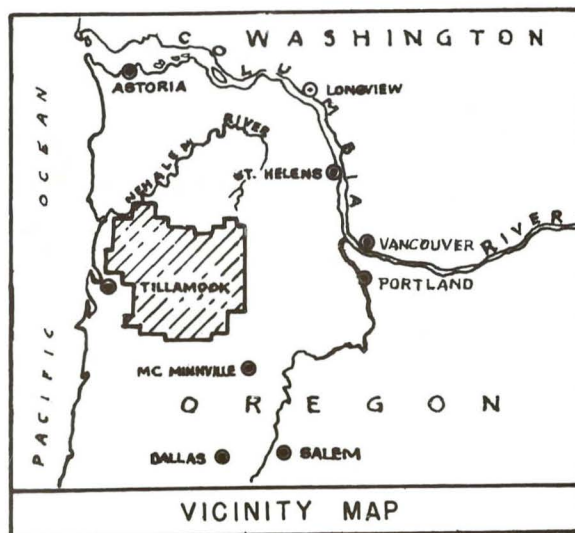
land should be vested in either agency in accordance with their willingness and ability to do the job. Decision on details of jurisdiction is one of the first problems to be solved before the comprehensive engineering studies necessary for salvage, road work, planting and supplemental fire protection are undertaken.

H. J. ANDREWS
Regional Forester



TILLAMOOK BURN STUDY AREA

APRIL 1944



SUMMARY
of
THE TILLAMOOK BURN STUDY 1942-43
U.S. Forest Service - Region 6
April 1944

HISTORY AND DESCRIPTION OF THE AREA

The Tillamook Burn study area, discussed in this report, occupies approximately 462,000 acres - 722 square miles - in Tillamook, Washington, and Yamhill Counties of northwestern Oregon. Although it is at present largely undeveloped, denuded, snag-infested, and generally in an unproductive condition, intrinsically its soil, climate, and location with reference to markets are outstandingly favorable factors. Lands principally suitable for the continuous growing of forest crops comprise 98 percent of the area, two-thirds of it highly productive, (site quality II or better) and the remaining one-third largely above average productivity, (site quality III). Any survey of the State or of the Nation made to determine where timber can be grown to the best advantage would unquestionably include this part of the Oregon Coast Range near the top of the list. Only a small percent of the forest land from the Atlantic to the Pacific is capable of producing as much timber per acre per year as this problem area.

Table 1

STUDY AREA BY COUNTIES

		: Square :	
County	: Acres	: Miles	: Percent
Tillamook	: 325,970	: 509.3	: 70.5
Washington	: 97,100	: 151.7	: 21.0
Yamhill	: 39,205	: 61.3	: 8.5
TOTAL	: 462,275	: 722.3	: 100.0

As indicated on the map (page 6) the boundaries of the study area were drawn to include the lands covered by the 1933 and 1939 fires and sufficient adjacent closely related lands to make a compact unit. Prior to 1933 its history was typical of most of the Coast Range country. There had been several large fires and logging was progressing from several directions. At that time the interior

of the area, which is the most rugged in topography, contained thousands of acres of high quality old growth Douglas-fir forest. Entire sections would cruise 75 to 100 thousand board feet per acre. Individual trees 6 to 8 feet in diameter were common. It was a great storehouse of timber -- billions of feet of it -- that promised a continuous flow of sawlogs, wages, and other income to adjacent communities far into the future.

Logging reached the fringes of the unit about 1915. Most of these were railroad operations, and up to 1933 were concentrated in four or five well defined areas. Between 1915 and 1933, 46,000 acres had been cut over. In 1918 an insect infestation killed most of the hemlock on 18,000 acres. The Cedar Butte fire of 1918 burned about 40,000 acres, much of which restocked promptly. Otherwise the area remained in much the same condition as when the first white settlers moved into the surrounding country. In 1933 the interior was still undeveloped. There were no roads and but few trails. It was practically uninhabited.

In 12 days of 1933 all this was changed. Between August 14 and 26 of that year the Tillamook fire burned over 245,000 acres and killed 10 billion feet of saw timber. It transformed 380 square miles of Oregon's best timber-producing lands -- a national asset capable of supporting a large number of people indefinitely -- to a liability which bids fair to tax the combined efforts and resources of two generations to overcome. The damage, serious as it was, was increased by the Saddle Mountain fire of 1939. This fire reburned a large part of the Tillamook Burn. It killed reproduction that had started since 1933 and destroyed most of the seed trees that had escaped the previous fire. It also burned an additional 28,000 acres of green saw timber and second growth not touched by the 1933 Tillamook fire.

Since 1934, salvage logging has been the principal activity on the area. The green timber is of course also being logged. In a few more years the timber killed in 1933 will probably have deteriorated to a point where further large scale salvage operations for lumber alone are unprofitable. Small operations may, however, continue several years longer, depending upon market conditions at that time.

The unit lies along the Coast Range from Salmonberry River on the north to the Trask-Nestucca Divide on the south. Three-quarters of the land is drained by coast streams and the remaining quarter drains into the Willamette River.

The topography is rugged and broken. Elevations range from sea level to slightly over 3,500 feet on several of the higher peaks and ridges. Soils suitable for farming comprise less than 2 percent of the total and are confined principally to narrow river valleys and foothill slopes.



Burned 1935 - Reburned 1939

Photo by Bureau of
Entomology & Plant
Quarantine

Since all parts of the area are within 40 miles of the Pacific Ocean, the climate is generally mild and humid. The eastern slopes of the Coast Range have a greater seasonal range in temperature and receive less rainfall than the western slopes. Annual precipitation ranges from 70 to 120 inches, with four-fifths occurring from October 1 to March 31. Snow is infrequent and seldom remains on the ground except at the higher elevations. The frost-free period varies from 140 days at the crest of the mountains to over 200 days near the coast. Prevailing winds blow from the ocean - hence the mild climate - but occasionally there are east winds from the Columbia Gorge, cold in winter and hot and dry in summer.

Abundant rainfall, a long growing season, and good forest soil all favor production of a dense and luxuriant forest cover. Prior to 1933 most of the area bore a heavy stand of Douglas-fir, hemlock, and cedar, with some Sitka spruce along the west boundary. An understory of hardwoods, shrubs, and tolerant conifers, with ferns, herbs, and mosses occupied the remaining ground space.

About 250,000 acres have been so completely denuded and are now so devoid of a source of seed that planting of trees is necessary. Even on areas best suited for rapid tree growth, brush is becoming so dense as to make planting more expensive, and satisfactory tree survival less certain. An early start on a large-scale planting program is imperative for these reasons alone. Long experience with similar situations indicates that only a small portion of these 250,000 acres will reseed naturally from existing seed sources. On the other hand, there is nothing gained by planting unless the snag menace has been reduced enough to make fire protection reasonably successful. This subject is discussed on pages 13-15.

From its nearest point on the east boundary, the area is 30 miles by highway or rail from Portland, and the western edge is only four miles from Tillamook. The Wilson River Highway passes through the center and there are secondary roads built by loggers and the Civilian Conservation Corps in the Salmonberry, Wilson, Tualatin, and Trask watersheds. The logging railroads of the Consolidated Timber Company and Stimson Lumber Company connect the northeast portion with branch lines of the Southern Pacific and the Spokane, Portland, and Seattle Railroads, but these will, no doubt, be abandoned as soon as profitable salvage is at an end. Although there are some excellent transportation facilities, large segments of the unit are low in accessibility. Roughly half of the unit is more than one-half mile from any road. Only the fringes, together with a zone along the Wilson River Highway and a few logging roads are within one-half mile of satisfactory roads. Practically none of the country at the headwaters of the Tualatin, North Fork Trask, and Kilchis Rivers has any roads, and there are large roadless areas in several tributaries of Wilson River.

PRESENT CONDITIONS

Timber Utilization and Depletion

It is estimated that the study area contained approximately 25 billion FBM of timber prior to white settlement. Since the present old-growth stands contain only 2.9 billion feet, total depletion for the 100-year period 1843-1943, has been approximately 22.1 billion feet. This is divided by periods and causes as shown in Table 2.

Table 2

TIMBER DEPLETION - TILLAMOOK BURN STUDY AREA

Cause and Date of Depletion	:Volume Killed or Removed	
	:Billion FBM	: Percent
All causes - 1845-1915	: 4.8	: 21.7
Cedar Butte Fire	: 2.0	: 9.1
Defoliation by hemlock looper (1918-21)	: .4	: 1.8
Cutting 1915-33	: 2.3	: 10.4
Tillamook Fire 1933	: 10.1	: 45.7
Bark beetle infestation 1934-36	: .2	: .9
Saddle Mtn. Fire 1939	: .8	: 3.6
Cutting since 1933 (green timber only)	: 1.5	: 6.8
TOTAL	22.1	: 100.0

Logging of the timber killed by the 1933 and 1939 fires, together with unburned islands scattered throughout the Burn, was started by several large companies in 1934. Other operations, most of them smaller, went in later, and in 1943 fifteen companies were cutting timber within the unit.

It is estimated that only 10 to 15 percent of the fire-killed timber had been salvaged by 1942. Recovery has ranged from 30 to 70 percent of the volume originally on the areas logged. Because of the rapid deterioration of species other than Douglas-fir and cedar, salvage has been confined chiefly to these species. The deterioration of Douglas-fir sapwood has largely limited the cutting to large, old-growth timber since about 1935 or 1936. Gradual deterioration of Douglas-fir heartwood through decay and wood-boring insects has further decreased the percentage of recovery, year by year. Beginning with 1940, this has been partially offset by war demand and the consequent higher prices received for logs and lumber. The result has been more intensive utilization of timber. Lower grade logs have been taken out, and it has been possible to log



Sawlog Salvage Completed

profitably smaller and more inaccessible blocks of timber than heretofore. The larger bodies of green old-growth timber are being logged along with the fire-killed material.

Even so, a few more years will probably bring an end to large-scale salvage operations for lumber alone. If, at the close of the war, processes and markets can be developed to utilize the tremendous quantities of logs and wood remaining on the area, such operations might well continue for some time to come. This problem will be discussed later.

Protection

The Tillamook Burn is without doubt the worst fire control problem area in the Pacific Northwest and the fuel hazard will become progressively more dangerous for many years. There are 263,000 acres of snags which constitute an extreme hazard and make the control of fires, once started, practically impossible. Past history of fires in snags in Oregon and Washington leaves no doubt on this score.

The Burn casts a shadow over thousands of acres of forest land beyond its borders. The high hazard fuel types are not only a menace to the rehabilitation of the immediate area but they are a real and constant threat to adjacent lands. This must be taken into consideration both in making plans and in justifying expenditures.

Protection at present is furnished by the Northwest Oregon Forest Protective Association, an incorporated organization of the larger landowners, many of whom are also logging operators. This Association protects a total of 1,434,000 acres in Tillamook, Columbia, Clatsop, Washington, Yamhill, and Multnomah Counties. It is supported by assessments on the land protected and present owners will probably find it difficult to pay this cost after the salvage and other cutting are completed.



Typical Area of Heavy Snags

Table 3

AREAS - BY FUEL HAZARD TYPES

1942

Arranged in Relative Order of Hazard

Type Description	: Acres	: Percent
<u>Snags</u> - Dead timber in which there has been no cutting.	: 211,415	: 46
<u>Snags and Logging</u> - Partial cut dead timber with slash burned or unburned.	: 51,530	: 11
<u>Clear Cut</u> - Logged lands, burned or unburned, containing one snag or less per acre. Not sufficient reproduction to shade the ground and reduce the hazard.	: 47,775	: 10
<u>Timber, High Hazard</u> - Green or part green timber with high or extreme fuel hazard due to fire, cutting, wind, insects or disease.	: 36,835	: 8
<u>Timber, Low Hazard</u> - Green young or old timber where shade, ground cover and absence of snags result in a low or moderate fuel hazard.	: 105,830	: 23
<u>Agricultural and Miscellaneous</u>	: 8,890	: 2
TOTAL	: 462,275	: 100

From past experience, it can be safely said that protection of this area at present is wholly inadequate to give reasonable assurance of keeping out fire, or of controlling fires once they occur. It is estimated that the suppression of the Saddle Mountain Fire of 1939 cost \$374,000. It is altogether possible, if not probable, that such fires may again occur. If so, the suppression costs may be equally high, depending upon the type and scope of action taken.

Prevention is important in this area; once a fire starts it may be impossible to stop it because of the snags and heavy fuels. There have been closures applied in the past, but they could be made much more effective. There will probably always be some man-caused fires, and lightning fires cannot be prevented. The prompt detection of those fires which do occur is vital, and the detection system is

at present insufficient for this purpose. In 1943 there were lookouts on Round Top, Saddle Mountain, Trask Mountain, Edwards Butte, Cedar Butte, and Rector - six in all in or near the area, some of which had inadequate facilities. In addition there were 11 firemen stationed throughout the unit. Some of these positions are also of limited value for detection. It is very doubtful whether adequate detection can be secured, however, without adding at least 15 lookouts, making a total of 21. Most of these should serve in the dual capacity of lookout-fireman, but they are needed first of all for detection. To handle the suppression job, at least 22 firemen are needed to cover the area fully, together with station improvements at the sites occupied.

In addition to the individual lookouts and firemen already mentioned, standby and cooperator crews are essential to successful fire control in this extremely difficult area. Provision should be made to mobilize a crew of 50 to 100 men anywhere in the Burn within an hour after a fire is reported. To have such numbers of men readily available, it will be necessary to coordinate road building, hazard reduction and salvage operations with the fire control job and to fully develop cooperative arrangements with logging operators in and near the area.

Without satisfactory roads and trails, telephone lines, and radio, protection personnel cannot function effectively. At present there are 311 miles of permanent roads, of which 182 miles are sub-standard and in need of betterment. In addition, 277 miles of new road should be built. There are 30 miles of temporary spurs which should be retained - all of them in unsatisfactory condition and needing betterment. There are only 10 miles of trails at present, with 136 additional miles required; 201 miles of telephone line with 165 more miles needed; no fully satisfactory radio installations; less than 10 percent of the station improvements necessary for personnel; and there is very little motor and specialized fire equipment for season-long personnel or suppression crews.

Land Use

In the Tillamook Burn study area of 462,000 acres, 98 percent is potential forest land. Of the total, however, 287,000 acres or 62 percent is deforested and not restocked. Much of this has burned twice or more, and is covered with varying proportions of brush, ferns, and weeds. It is believed the soil has not been seriously impaired, but the succession of fires has destroyed most of the reproduction and the seed trees as well. Douglas-fir will sometimes seed naturally for a distance as great as one-half mile from standing live timber. During high winds, there is likely to be a considerable amount of seed which falls 1000 to 3000 feet from a group of seed trees; but over a full season, by far the greater part of the seed is concentrated within 1000 feet of its source.

Eventually, and provided fire is kept out, the entire area might restock naturally, but many years would be required and much of the timber probably would be widely spaced, limby, and poor in quality. Planting appears to be the only practicable solution.

Farm or potential farm lands, both cultivated and pasture, occupy chiefly the valley bottoms along the main streams and foot slopes. These lands are included in the study area because boundaries were drawn along section and township lines and could not be conveniently laid out to exclude them. Thus, the farm lands are either fringes and stringers along the edges of the study area and connected with the larger agricultural areas outside, or are small islands within the area. They comprise in all only 8835 acres, but they have a close relationship with timber production in spite of their limited scope. Farming involves occupancy, and occupancy, either of forest land or land contiguous to it, involves risk of fire. The degree of risk depends upon the character of the farmers and their farms. In general, farmers living along forest fringes are engaged in a constant struggle against forest and brush encroachment and use fire to clear their land. Sometimes fire gets away. There is no evidence that either undue carelessness or incendiarism has been a factor to date, but strict control measures should be imposed upon clearing fires to reduce the risk from this cause to a minimum.

Watershed Protection

Information about the effect of the Tillamook and Saddle Mountain fires upon streamflow and soil erosion is meager and inconclusive. What there is, however, indicates that the effect of these burns on soil erosion may be nothing more than an episode in a cycle of "normal" erosion, that the soil surface is now largely stabilized by brush and ground cover, and the values put in jeopardy by erosion and flooding are not excessive.

The general indications are that as much as three or four inches of soil was displaced on large areas. No doubt considerable fertile top soil was removed. The effects and significance of this erosion are not definitely known. Certainly some soil got into streams and impaired the quality of the water. Within three to four years, however, this erosion was arrested by new vegetative growth. The net results cannot now be determined with any degree of accuracy.

Water Power

None of the streams in the study area has been indicated by the Corps of Engineers to be suitable for power development in the immediate future.

Recreation

Today the recreation values and possibilities of most areas, such as this are measured, first, by their accessibility to automobile traffic, and second, by attractions on the ground, once the recreationist has arrived there. With only one highway (Wilson River) traversing the unit, and only a few reasonably good roads, accessibility, in general, is poor. Fire has destroyed the attraction of the forest. Picnic grounds, resorts and other accommodations are lacking. What now remains is fishing water and game. As the snags fall, all but the larger streams will be "plugged" with down timber, and the hillsides will become increasingly difficult for hunters to travel on foot or horseback. The outlook for the recreationist, resort owner, guide and dude rancher is not bright. Oregon and Washington contain many thousands of acres of equally accessible and more attractive land for the recreationist to use.

Land Ownership and the Tax Situation

As of June 1943, 50.4% of the study area was in private ownership. Of this, the small owner with up to 1280 acres owned slightly less than one-third. Large ownerships, up to as much as 50,000 acres, accounted for the remainder.

Table 4

PUBLIC OWNERSHIP IN THE TILLAMOOK BURN AREA 1942

<u>Jurisdiction</u>	<u>Acres</u>
National Forest	360
Public Domain	17,000
O&C Revested Lands	18,560
State of Oregon	25,835
Tillamook County	133,680
Washington County	21,637
Yamhill County	7,200
Municipal (Watershed)	<u>5,080</u>
Total	229,352

Since the fire, there has been a marked trend toward consolidation of ownerships. The large private owners now hold lands in solid blocks, well back from the boundaries, while the small ownerships are usually found along or near the edges. The intent of most owners from the first has been to liquidate their holdings. After

logging, the greater part of the land has been abandoned to tax delinquency, or donated to the County or State. The County and State ownerships were practically all built up in this way, and include former private ownerships of all sizes - not only those of the larger operating companies, but those belonging to individuals who could not afford further investment in taxes or in roads to log the fire-killed timber.

Tax delinquency was increasing prior to 1933, but rose rapidly after the fire and as the depression progressed. See Table 5.

Table 5

Total Tax Delinquency in Tillamook, Washington and Yamhill Counties

All Classes of Property

Source: 16th Biennial Report, State Tax Commission of Oregon

Taxes Delinquent on June 30, 1942

<u>County</u>	<u>For 1930 and prior years</u>	<u>For 1931-6/30/42</u>	<u>Total on 6/30/42</u>
Tillamook	\$222,376	\$1,692,048	\$1,914,424
Washington	33,534	332,890	366,424
Yamhill	<u>63,340</u>	<u>472,025</u>	<u>535,365</u>
Total	\$319,250	\$2,496,963	\$2,816,213

The future appears extremely doubtful for private ownership of land for timber production in the study area. The fire hazard is high, the cost of adequate protection and rehabilitation excessive, taxes prohibitive over a rotation period, and income negligible over the same time. Owners of much of the green and fire-killed old growth and some of the merchantable second growth will, however, probably hold their timber for logging as long as market conditions permit, then abandon the cutover lands for taxes. The agricultural areas will probably remain in private ownership.

Although the trend is constantly toward public ownership, the counties alone cannot finance programs that will adequately protect and rehabilitate the land or build roads to make it accessible; nor can they afford to carry it at a loss for an indefinite period. When the broader aspects of the social and economic problem are considered, the land appears most suitable for State or Federal ownership, in which case the costs of making it again productive are most readily absorbed.

Table 6

LOCAL GOVERNMENT ECONOMY

Total Assessed Valuation by Counties

<u>1932</u>	<u>Tillamook</u>	<u>Washington</u>	<u>Yamhill</u>
Assessment Rolls	\$16,411,135	\$22,785,525	\$18,625,180
Public Utilities	<u>1,327,720</u>	<u>3,035,890</u>	<u>1,535,795</u>
Totals	\$17,738,855	\$25,821,415	\$20,160,975
 <u>1942</u>	 <u>Tillamook</u>	 <u>Washington</u>	 <u>Yamhill</u>
Assessment Rolls	\$ 9,726,020	\$22,589,330	\$18,618,270
Public Utilities	<u>1,314,530</u>	<u>3,322,409</u>	<u>1,754,636</u>
Totals	\$11,040,550	\$25,911,739	\$20,372,906

Private contributions to local government will become less as the tax base shrinks or if the Burn remains unproductive, especially in Tillamook County. In the three counties the fires caused a total loss in assessed value of 6 to 7 million dollars, and an annual tax loss of about \$240,000, of which \$200,000 was lost by Tillamook County. In 1942 this represented 48.9 percent of that County's tax levy. Because the annual tax loss to Washington and Yamhill Counties was much smaller, the amount and diversity of their taxable wealth greater, and their populations larger, these two counties have not suffered as seriously as has Tillamook County.

State and National Economy

Under past liquidation cutting practices, the 10 billion board feet of merchantable timber on the area in 1933 would perhaps have been cut at an approximate average rate of 500 million feet per year for 20 years. If the usual proportion of logs had gone to sawmills, the total population that could have been supported would have been about 24,000 persons, including about 4000 workers in woods and mills, and 6200 workers in service industries of various kinds. Assuming an average annual income of \$1500 per worker, labor would have received over \$15,300,000 annually for 20 years. After 1953 the income would have largely ceased. The counties would have received \$240,000 in taxes for 1933, and roughly, one-twentieth less for each succeeding year, until in 1953 practically all the land would have been cut over and taxes reduced to little or nothing. Cut-over land would have increased at the rate of 13,000 acres per year. Had it been held by the operators during the 20 years of cutting, it would perhaps have paid an annual tax of about \$21,000, but more likely much of it would have become tax delinquent as soon as cut over and

furnished no tax revenues to the counties. The total tax received by the counties would have been approximately \$2,400,000, or an average of \$120,000 per year.

THE PROBLEM

As a result of the Tillamook and Saddle Mountain fires, and the liquidation and salvage cutting which have since taken place, the State of Oregon and the three counties involved will have a major problem of rehabilitation to be solved at the close of the war.

The characterization of the Tillamook Burn as a problem carries the implication that current methods of handling the area are unsatisfactory. The two outstanding characteristics of the Burn are the excessive fire hazard and lack of satisfactory growing stock or sources of seed from which to build up new growing stock. The normal level of protection which the Burn has received during the last 10 years is not designed to cope with either of these two situations. Without intensive protection and large scale hazard reduction, fires comparable to the Saddle Mountain Burn of 1939 are almost certain to recur from time to time. There will be an ever present hazard that such fires will spread beyond the boundaries of the Burn, and hence long time management of adjacent areas would become a highly speculative venture. Furthermore, normal protection expenditures are justified primarily on the basis that lands being protected are, or in due course of time will be, in a productive condition so that eventually the protection services will result in the production of a second growth of timber. There is practically no hope of bringing the Tillamook Burn into productive condition through the application of normal fire protection over an extended period of time. Hence, continuation of present policies in respect to the Burn will lead inevitably to incurrence of excessive fire suppression costs and destruction of adjacent timber or growing stock with no positive return to balance such expenditures for centuries. Because of these conditions and because the Burn is one of the outstanding sites for growing timber in Oregon, it is imperative that some program be devised to terminate the type of treatment which has prevailed since 1933 and to establish measures of rehabilitation the corner stones of which are intensive protection, hazard reduction, intensive salvage and reforestation.

The problem, stated in its broadest terms, is how best to obtain the return of these lands to their fullest productivity within the shortest time practicable. This does not mean a complete return to pre-fire conditions with a high percentage of large old-growth timber. Such a condition cannot again be economically brought about. It does mean, however, the full restocking of all of the area, either naturally or artificially; adequate protection of the timber until it reaches commercial size; and proper management and harvesting of

the crop according to standards and practices which will insure a continuous yield for the years to come.

From the foregoing pages, it is clear that under present utilization standards little may be expected in the way of immediate financial return to individuals or local governments after salvage of fire-killed timber and the remaining islands of green timber is completed - probably four or five years from now at the latest. As a fully stocked forest, however, the area is capable of continuous large-scale timber production.

Merchantable stands now in stable ownership (state and federal) total about 300 million feet. On a sustained yield basis, about 6 million feet would be cut annually from these stands for about 50 years at which time the present immature stands would be ready for cutting. However, it is doubtful if such a small annual cut would be continuously maintained from such a large area. It is more likely that the merchantable timber will be cut in larger amounts and more or less sporadically. How much time will elapse before fairly large volumes of second-growth timber can be cut in order to maintain a fair size industry and again contribute materially to community support depends, among other things, upon future utilization and the product that is to be manufactured.

Potential annual growth on commercial forest lands within the study area is estimated as follows:

For trees	4" or more d.b.h.	-	55 million cubic feet
"	"	12" " " "	- 275 " feet B.M.
"	"	16" " " "	- 200 " " "

The following three plans for cutting of second-growth timber now on the area lead ultimately to the potential yields from all land, assuming that the area is planted according to the plan proposed.

1. Saw timber, with utilization of trees 16" or more d.b.h.

Beginning 60 years from now about 50 million feet per year could be cut for 60 years; then cut could be gradually increased to the ultimate annual yield of 200 million feet.

2. Saw timber, with utilization of trees 12" or more d.b.h.

Beginning 40 years from now about 70 million feet per year could be cut for 60 years; then cut could be gradually increased to the ultimate annual yield of 275 million feet.

3. Pulpwood. Beginning 30 years from now about 15 million cubic feet per year could be cut for 40 years and then cut could be gradually increased to 55 million cubic feet. For the first period, trees 12" or more d.b.h. would be utilized; after then trees 4" d.b.h. and larger would be utilized.

Under either of the first two plans above outlined, the cut from this area would support a population of about 12,000 people, of whom 5100 would be workers in the woods, mills and servicing industries. The annual labor income alone would be about \$7,650,000. This income would be permanent and reasonably stable from one year to the next. If markets and manufacturing were developed for more intensive utilization of lumber, specialty articles for the trade and remanufacturing of various kinds, the local benefits would increase accordingly.

These then are the problems and objectives of the work: rehabilitation and protection of the area, stabilization and management of the timber yield, and with it the building up and maintenance of permanent industries and forest communities.

THE ACTION PROGRAM

In a program as large as this one, the sequence of the action proposed is open to discussion. There are numerous alternatives, of course. There are also valid arguments for varying the precedence of one activity or another. The end result in each case might or might not be the same, but the fact remains that one clear-cut action policy and program is necessary to guide and control the undertaking and to expedite its conclusion within the shortest time and at the least cost to all agencies and individuals concerned. As a matter of fact, time in this case is synonymous with cost. The sooner the area can be transformed from a protection liability to a producing asset, the lower will be the total protection expenditures and the greater the return to the community as a whole.

This discussion is, to a considerable extent, general. Each step outlined will require thorough exploration, considerable research, careful planning and adequate execution to be effective. In most instances the activities are interdependent and closely related. For example, there is small justification for planting until sufficient hazard reduction has been accomplished to safeguard the work. Also, a great deal of the work hinges on the close of the war, the availability of funds, and an adequate supply of labor. The overall plan of detailed action must be sufficiently elastic to accommodate itself to the economic conditions prevailing during its continuance.

Protection

Until ownership can be stabilized, and until road construction, hazard reduction and planting can be started after the war, the immediate need is for adequate protection through greatly increased detection and suppression personnel including crews, more and better

fire equipment and closures. The average annual loss in burned area at present is over 2.5%. This should be reduced to 0.25%. The only way in which it can be done is to tighten up on prevention, prepare for emergencies, reach all fires when they are small and put them completely out by means of decisive suppression action. To this end a joint agreement and an immediate action program by the State of Oregon, Northwest Oregon Forest Protective Association and the Forest Service are necessary. Such an agreement should be formulated as soon as practicable.

The above action, however, is merely a stop-gap. The real long range need is for (1) a comprehensive fire plan embracing prevention, hazard reduction, transportation, communication, detection, and suppression; and (2) decisive action in putting the plan into effect progressively as facilities are provided.

The relative order of precedence cannot be adequately outlined in a discussion as brief as this one. The most expeditious arrangement would, of course, be the employment of large numbers of men to work simultaneously on roads, trails, telephone lines, buildings, salvage, and hazard reduction, as soon as these can be planned, with the objective of finishing the entire job in five or ten years. The practical approach will, no doubt, be a more gradual extension of these facilities over a much longer period. This calls for (1) preparation of detailed plans and cost estimates, (2) a selection of projects in priority order on the basis of greatest need and greatest return.

On roads, the greatest immediate need is for mileage leading into and making more accessible the larger unreached areas of high hazard and high inflammability, along with enough construction to take care of the buffer strip along the east boundary adequately. As soon as trunk projects are completed, secondary ones should be added, gradually working down to those of lesser return and importance from the protection standpoint. There again, road construction dovetails closely with utilization of salvage materials, hazard reduction, and planting. The order of precedence may, and probably will, be varied to accommodate these activities to the greatest degree practicable at the least expense to protection.

Trail and telephone line construction must be kept well to the fore to serve and accommodate the protective organization. Protective improvements such as cabins, towers and other structures should be installed as rapidly as practicable to house and facilitate these men.

To summarize this brief discussion of protection, the first need is for preparation of an adequate, well balanced, long range plan which will reduce the annual loss to .25% or less. The second step is the programming, in priority order, of the action to be taken to serve protection needs and at the same time facilitate salvage and

planting. The third phase is the actual construction of improvements and placement of men in accordance with the plan. The final action required is the proper administration of these facilities to make the plan work.

Table 7

Summary of Estimated Costs of Fire Control
(Cost of fighting fires not included)

<u>Items</u>	<u>Quantity</u>	<u>Cost</u>	<u>Annual Maintenance</u>
Roads, construction	242 miles	\$ 1,450,000	\$ 5,000
Roads, betterment	341 "	140,000	7,000
Roadside cleanup	341 "	680,000	
Hazard reduction (without salvage)	293,000 A	13,900,000	-
Trails, construction	136 miles	68,000	1,350
Telephone lines	156 ")	90,000	1,600
Radios	36 units)		
Buildings	-	283,000	17,000
Fire equipment	-	148,000	41,000
Salaries	-	-	44,280
Operation, misc. expenses	-	-	20,000
Totals		\$16,759,000	\$ 137,230

Cost per acre: pro-rated over 462,000 acres in study area.

Capital costs - roads, hazard reduction, improvements, etc. \$36.27
per acre.

Annual maintenance and operation, per acre 30

It should be noted that of the estimated total cost of \$16,759,000 for the project, \$13,900,000 is for hazard reduction - mostly snag falling. This could, no doubt, be reduced very appreciably through salvage operations discussed at some length in a following section of this report.

Ownership

Stabilization of ownership will come about in time as a result of liquidation of holdings, tax delinquencies and county and state acquisition. This can and should be hastened both through legislation and through action pointed toward public ownership. Again, this calls for agreement between the agencies involved as to the zone of influence and future plans of each. Any agency proposing to acquire and administer a portion of the Burn must of necessity have a financial plan for carrying through both the immediate protection and post-war rehabilitation (hazard reduction and planting) in order

to redeem its responsibility successfully. Agencies contemplating acquisition of certain areas should also plan in advance full cooperation with adjoining administrations in both protection and administration of the land they propose to acquire. Provision must be made for adequate administration and protection of all the area because to allow any part of it to go without proper treatment would lead to disaster for the intensively treated part. If legislation, either federal or state, is necessary to permit or facilitate stabilization of ownership, it should be drafted and expedited insofar as possible.

Finance

To a large degree, final ownership should hinge on ability to finance and administer an adequate program. Lands held in their present status, without adequate protection and with no systematic plan and ability on the part of the owner to rehabilitate them, contribute nothing to the overall objective and serve as a "drag" on the program as a whole. Without doubt the overall costs of rehabilitation and the lack of appreciable revenues for a long time in the future will preclude private or county ownership. Whether the State of Oregon will finance a unit of appreciable size is for the State to decide. Whether it can secure a federal grant or loan depends upon Congressional action. If enabling legislation were enacted to permit the establishment of Forest Service jurisdiction on a portion of the area, additional funds would still be needed to do the job.

Salvage

The utilization of timber products to date has been covered in the section "Timber Utilization and Depletion," pages 11-13. The potentialities of eventual sustained yield management are briefly outlined on page 22. The question as to what can be expected in the intervening period is of vital concern to the private owner, the counties, the State of Oregon, and to the local communities tributary to, and largely dependent upon the area for a reasonable livelihood and prosperity.

As has been previously stated, large scale salvage operations for saw timber as a private enterprise for profit will most likely come to an end in a few years, due primarily to the progressive deterioration of the most accessible timber. Small operations may continue for some time but the total output will not be large in comparison to the amount of sound material remaining.

Since the elimination of snags is a "must" in any sound plan for the rehabilitation of the area and since the elimination of snags for hazard reduction alone is a heavy expense, there obviously is an opportunity to combine salvage and hazard reduction and reduce the cost of either operation if separately conducted. Where the cost

of salvage exceeds the probable return there is the possibility of working out a plan whereby salvage would be encouraged by a subsidy. Such a subsidy might provide roads or pay the cost of falling and it would be justified by the contribution salvage would make to hazard reduction. Every snag felled for salvage would be just one less snag to be felled for hazard reduction.

So far, the work of salvage has been directed only toward logs for lumber and veneer, with a little fuelwood cut along the highways and close-in roads. This has resulted primarily in removal of only the higher grade logs from the more accessible sections of the Burn, leaving large quantities of lower grade material relatively close to transportation, and all grades in the more remote sections not yet tapped by roads. War markets and war prices have had an appreciable effect on the course and extent of log salvage. Even at pre-war price levels it was, of course, possible to log some watersheds profitably, particularly the more accessible ones, and those carrying fairly heavy stands of good quality snags, together with green islands of varying size. With the marked increase both in demand and price brought about by the war, the zone of profitable logging was appreciably extended and the utilization of lower grades made possible.

It is, of course, impossible to predict price trends after the war with any degree of certainty. It is reasonable to suppose, however, that both demand and prices will decline - not immediately perhaps, but eventually. Even under the most favorable circumstances in protection and restocking, no extensive production can be looked for in the Burn for at least 40 to 60 years. Intensive salvage appears then to be the one "hole card" remaining to which the county, local industry, and local population can look for revenue and profit in the intervening years. The greater the variety of salvage products, the better the opportunity for stable income, even though prices of some products drop appreciably in the post-war period.

Before we can say with assurance that salvage will be profitable on a large and varied scale, much work must be done in the field, in the office, and along the lines of technical investigations in manufacturing processes and the economics of production and marketing. The following discussion outlines in a preliminary and sketchy way some of the data needed, and the questions to be settled before going further into the subject:

1. Lumber. Up to the present, about 1.2 billion feet B.M. of salvage logs have been removed from the area. Data should be secured on stumpage prices paid; logging and hauling costs; log prices received at the mill or railroad; log grades utilized on each operation; recovery in lumber grades from the various log grades cut. At this time it will no doubt be difficult to gather accurate data in many cases, but sufficient information is needed to determine:



Typical Logging Road for Salvage

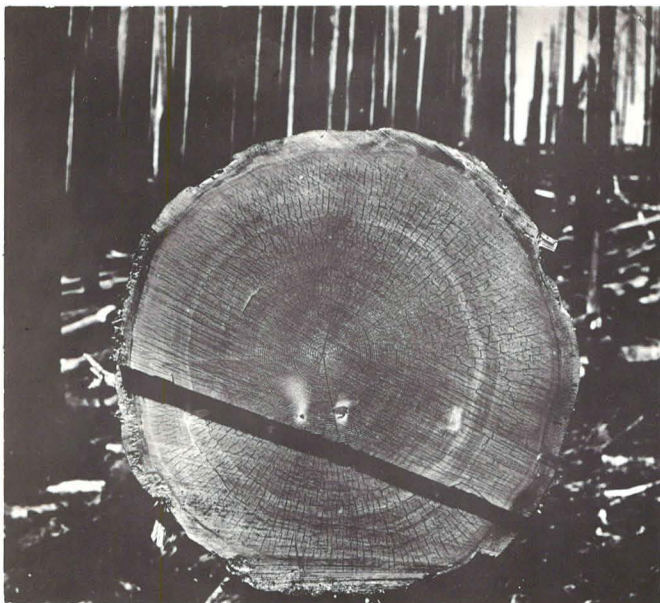
- (a) Cost of logging this timber.
- (b) Hauling costs.
- (c) Price paid for logs at the mill.
- (d) Grades possible to log at a profit.
- (e) How much and what grades are left in the woods.

Assuming that the above information is available, together with a cruise of the unlogged sections, it would be possible to determine which areas still offer opportunities for the present type of logging at a profit; also, which areas could be logged on a subsidy basis and how much subsidy would be needed to dispose of the logs. Along with this, there are other factors to be studied, such as special utilization methods. For instance, could large logs with heartrot, but carrying a shell of high-grade material inside the sap, be profitably cut into cants in small woods mills, the worthless material peeled off, and only the high quality sections taken out?

2. Ties. This product dovetails with lumber and lends itself particularly well to production in small woods mills, where short lengths, small logs, and those with a high percentage of defect can be cut up on the ground to eliminate long hauls of waste material.

The survey and analysis proposed for long log production (Item 1) can well be extended to cover tie material.

3. Plywood. Even before the war there was a heavy demand for plywood logs or "peelers". The uses of plywood have expanded widely during the past ten years, and it is reasonably certain that as the result of improved processes in manufacture and deferred construction activities, the demand will continue to increase after the war. Closer utilization of plywood logs and extension of manufacture to other species will increase production to some extent, but additional sources of supply are urgently needed. Tillamook Burn timber offers such a supply. The inventory or cruise of suitable timber should be carried along with that for lumber. Ability of plants to handle shorter peeler logs and work to smaller cores will be an important factor. Development of equipment and machinery to remove unsound and badly checked sapwood in the woods, rather than hauling it to the mill, should make it possible to handle material which otherwise would not be economically usable. Loss of bark from the older snags, heavy checking of remaining sound wood, and charring by later fires will be important factors. Even so, it is believed that the size and quality of much of this timber could still result in a relatively large production of plywood. Some of it might require subsidy. Quantity, location, grades and cost of logging, woods processing, transportation and milling should be determined in order to work out a suitable plan for utilization.



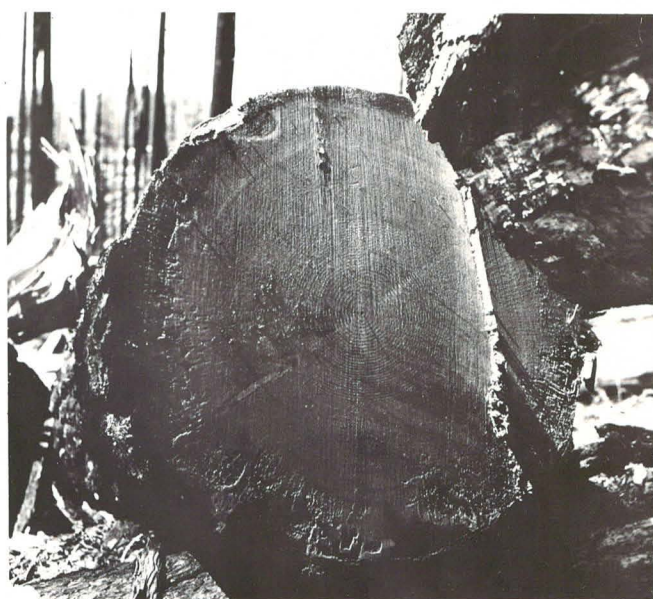
32" DIB 100' above base.
Little deterioration except for sap.
(Characteristic of entire tree)



33" DIB 40' above base.
4"-5" penetration of heartwood by Asemum
and rot (characteristic of basal 100')



30" DIB 75' above base.
6"-7" penetration of heart by Asemum and
Criocephalus. (Characteristic of entire
tree)



38" DIB 40' above base.
6"-8" penetration of heart by rot.
(Few insects in heartwood except in base of
log 1).

PHOTOS TAKEN 5/18/43 ON A SINGLE "SIDE" STIMSON LUMBER COMPANY OPERATIONS IN TILLAMOOK BURN

Photo by Bureau of Entomology &
Plant Quarantine

4. Fuelwood offers an outlet for much of the more accessible low quality material unsuitable for logs, ties and peelers. For both cordwood and hogged fuel, a strong demand exists in Portland and other nearby communities. Labor and transportation are the governing factors. At present, due to high cost of both items, production is necessarily very limited, but after the war it should be possible to utilize large additional quantities of wood for this purpose.

Some, perhaps much, of this eventually can be cut at a profit, although with a limited margin to the operator. Improved "cut up" and loading methods, heavier and more economical trucking units, and "direct to basement" deliveries are only three of the items that might be included in a study to determine ways of extending the use of this material.

One factor greatly favors fuel cutting; namely, its adaptability to hazard reduction along highways and roads. Wood is available along or close to most of the roads and highways, convenient to truck haul. A relatively high percentage can be used - the rest piled and burned. Its removal is one hundred percent hazard reduction, and as such, could be subsidized as much as perhaps \$1.50 or \$2.00 per cord and still result in an appreciable advantage over a strictly cleanup project with no salvage.

The possibilities of hogged fuel should be investigated also. Portable cut-up and hogging equipment seems entirely feasible. The question is whether a greater return would result from hogging in the woods and hauling the chips, or handling the material in cordwood or log form.

5. Chemical Uses. Alcohol production from wood is new industry in the United States, although well established in Europe. To what extent it can be adapted to salvage of burned timber remains to be seen. It is understood that the first war plant for this purpose is scheduled for the Eugene territory, and if successful there, it may well offer excellent possibilities for extending the range and volume of salvage in the Tillamook Burn.

If experience proves that one ton of wood waste actually produces in the neighborhood of fifty gallons of alcohol; if the 600 or so pounds of lignin resulting as a by-product can be sold or manufactured at a profit along with the alcohol; if post-war markets can be developed and retained against the competition of other alcohol processes; then alcohol production offers a real possibility for furthering salvage. It is understood that bark and charred and decayed wood in reasonable quantities, while of course cutting down on efficiency in transportation and processing, does not materially affect production. This is an important feature to be considered. No doubt it would be feasible to install machinery in the woods or at the plant which, prior to hogging or grinding, would dispose of much of this waste.

From studies to date, it appears that cutting and transportation to the plant would be the items that would make or break this form of utilization. Economical cutting, bunching, loading, and hauling would therefore be the first essential. It is not known how small a plant can be operated efficiently, and therefore whether it would be possible to set it up on the area; or whether one large unit would have to be built at tidewater and everything transported to it. Obviously, much study remains to be done along this line, and meanwhile, thousands of tons of material are being lost annually through progressive deterioration of logs on the ground.

Another possibility in the wood hydrolysis field is the growing of yeast from the wood sugar solution. This yeast, high in protein, is a valuable stock food. Wood carbonization is yet another field that merits exploration.

6. Pulpwood offers another possibility for salvage through utilization of wood for the manufacture of kraft paper and board. This, no doubt, calls for a large central plant with all raw material transported to it. Low cost per ton at the plant is a prerequisite for profitable production. Bark and charred wood must be eliminated. Whether a sufficient supply of clean wood can be assured, such a development must be ascertained by a careful survey of the timber and a thorough investigation of logging and transportation methods. The question is important enough to justify spending money on a survey.

Conclusions.

All of the products discussed above, either separately or in combination, offer possibilities for at least partially bridging the gap between 1944 and the time a new timber crop is available on the Tillamook area. Some of them can be produced at a profit; some will, no doubt, require subsidies. Factual information must be secured to determine the present status and future outlook for each. At the same time, others will no doubt come to light. From the viewpoint of sound business practice, no industries should be promoted or established unless they offer the chances of successful operation and return that any reasonably prudent man might expect in investing his own money.

Location of plants and establishment of remanufacturing industries are items of importance to the community. Portland would, no doubt, benefit from such a program, but the local communities would gain far more in proportion. One lumber mill, with reasonably long life expectancy, and a veneer plant, would add immeasurably to the stability of Tillamook. If an alcohol plant or a pulp mill were installed in addition, the benefits would be increased proportionally. Cutting and hauling of fuelwood or hogged fuel would bring in income, as would any other type of woods operation in the locality, even though the product moved into Portland rather than through Tillamook.

From the standpoint of transportation and manufacturing, the existing logging railroads (page 10) may prove valuable for further salvage operations. Their retention and acquisition for this purpose through use of Government funds should be weighed with this in mind.

The overall objectives should be:

1. An accurate and comprehensive inventory of what is left in the area.
2. A thorough appraisal of utilization possibilities with emphasis on costs, profits, and community benefits.
3. An action program, including necessary legislation, to put a sound program into effect at the earliest practicable date.

Hazard Reduction

The most satisfactory plan would provide for complete elimination of standing snags and removal of all materials which tend to increase the fire hazard and which contribute to the difficulty of controlling fires which may occur. Obviously, full attainment of this objective will take time. The alternative is to go as far and as fast in this direction as is practicable with the authority, funds and manpower available. This ties in directly with the salvage plan previously discussed. All of the timber which can be salvaged for any commercial purpose whatsoever reduces the amount which must be disposed of at a loss. The remainder should be removed as rapidly as facilities and funds permit.

As a part of the protection plan, a hazard map is essential. This includes, among other things, data on intensity and size of snags. From this information it will be possible to lay out a system of fire breaks designed (a) to keep "outside" fires out of the burn wherever possible, and (b) to control and restrict fires which may originate within its boundaries. Such fire-breaks act primarily as bases for control efforts. Alone, they will not stop a fire, but they do offer ready-made, snag-free lanes which, with the addition of trenching on the ground and backfiring, give fire crews the opportunity to stop fires which would otherwise be impossible of control.

The width of these breaks should probably range from 1/8 mile to as much as 1 mile or more, depending upon topography, size and density of snags. So far as practicable, snag-breaks should be located in conjunction with roads. As with roads, precedence should be given, first, to those fire-breaks which tend to isolate the Burn from the area of high risk and inflammability along the east boundary. Next in urgency is the north section. Thereafter, the larger snag area should be broken up as rapidly as possible, roadsides cleaned

up, and fire-proofing gradually extended as funds and manpower permit to include the branch and spur lines called for in the plan.

There is obviously a very close relationship between this activity and the actual protection plan. The planting plan must also be correlated with it. There seemingly exists no justification for planting an area in which it is known that fire cannot be controlled. For this reason, and in order to expedite the start of planting operations, the relative order of fire-break installation should be correlated with planting insofar as practicable.

Estimated costs for hazard reduction are included in Table 7. Naturally, these may vary tremendously, depending upon the final intensity of the timber utilization secured and the development of new and improved methods and equipment for snag removal.

Planting

An eventual expenditure of approximately \$3,000,000 is involved in replanting the 250,000 acres which, it is believed, will not restock naturally within a reasonable time. The size of the project merits a thorough study involving planting areas, species to be planted, nursery capacities and locations, progressive order of the work, probable rate of progress, and correlation with utilization of salvage materials, hazard reduction and protection.

First, the Burn must be mapped in order to determine where planting is required. Following this, it is necessary to determine what species should be planted, at what rate planting can be accomplished, and how much nursery capacity will be needed to furnish planting stock. Assuming that this has been done, a decision must be made on the relative order and importance of planting areas, taking into account the progress of protection and hazard reduction.

Even on portions of the Burn best suited for timber production, brush such as scrubby alder, willow and huckleberry is becoming well established. This undergrowth not only is a mechanical hindrance which interferes with the work of the planters but it casts so much shade that species like Douglas-fir and Port Orford white-cedar do not start well under it. The cutting of brush in advance of planting with equipment now available is very expensive, but it is possible that machinery designed to do a better and cheaper job can be developed. Areas not now heavily brushed over should therefore be chosen for earliest planting, and planting on the very brushy areas should be postponed until more satisfactory brush eradication equipment is available.

The original complete Tillamook Burn Report, pages 68 to 75, covers some of the above factors in more detail. However, a very considerable amount of both time and money should properly be spent

in working out a complete and detailed engineering plan for doing the job before it is begun. Roadside planting with stock from existing nurseries can, in some cases, be started now. However, this involves only a small fraction of the total. The entire job is a major one for specialists to handle throughout.

Summary

The foregoing paragraphs outline briefly the highlights of an action program. The responsibilities of participating agencies must be clearly defined. The plans and schedules of all should be correlated in such a way and to such a degree as will result in reaching the objective in the shortest time practicable and at least cost. The objective, restated, is the complete rehabilitation of the area from its present state to one of full productivity, including the utilization of all resources.

In addition to problems of protection, planting, utilization and salvage, there are those of agriculture, grazing, recreation, game management, erosion and water. Well up on the list also is the problem of human relations. Fully productive, this area is capable of supporting a very considerable population engaged in logging, milling, farming and other allied occupations.

The administering agency or agencies must be adequately staffed and financed to do the job. If legislation is required to this end it should be drafted and expedited.

At the close of the war, manpower will no doubt be available in sufficient numbers to do the work. The present is none too soon to start formulating plans of action. They should have been made ten years ago. Every year that action is delayed costs the community, state and nation a lot of money in lost incomes and lost profits as well as in excessive protection and suppression costs in comparison to the values protected.

PLAN OF WORK -- 1944-50

An accurate estimate of funds and personnel required for drawing up the plans, work schedules and specifications needed for the project is impracticable under present conditions. Each activity will require the attention of one or more qualified specialists. In addition, a coordinator should be on the job from its inception to correlate the individual sections of the work, guard against unnecessary overlap and prevent undue conflict. The above-mentioned work may be outlined as follows, assuming that one full year is allowed for the job:

Men
Required

1. Coordinator

A full-time man with considerable technical experience and executive ability to head up preliminary work on the project. If practicable, he should be selected with the idea that he will also assume charge of organizing and getting the action program under way 1

2. Protection

Detection -- Selection of potential points.

Visibility mapping. Final selection.
Determination of facilities required 2

Transportation -- Survey of existing system, location and standards. Additional needs and priorities. Location surveys.
Determination of standards. Mileage and cost estimates 4

Personnel placement)
Improvements) 2
Communication)
Equipment)

3. Hazard Reduction

Fuel type mapping. Mapping snag areas. Analysis of hazards. Plan for snag-breaks. Maps, engineering plans, estimates 3

4. Utilization and Salvage

Studies of potential products, utilization methods, manufacturing, markets, production costs 4

5. Planting

Assembling existing data on natural reproduction, sites, brush, and other factors affecting planting. Field mapping to supplement the foregoing. Planting plans and schedules. Coordination with protection and hazard reduction. Nursery sites and layouts. Survey of existing nursery capacities 4

		<u>Men Required</u>
6. <u>Ownership</u>	)	
7. <u>Finance</u>	)	
8. <u>Legislation</u>	)	3
9. <u>Inter-Agency Cooperation</u>	)	
10. <u>Community Welfare and Human Relations</u>	)	
TOTAL - ALL ACTIVITIES		23 men 1 year

The employment of twenty-three men for one year on mapping, engineering, investigations, specifications and work schedules does not appear out of line with the values involved. This is a major job of reconstruction involving forestry, engineering, manufacturing, economics, marketing and a variety of allied subjects. As much as five percent of the total estimated cost spent on plans and layout to insure economical and effective use of the remaining ninety-five percent is good engineering practice, well within allowable limits. Some of the data required have already been secured. Much additional field work is necessary, however, and the sooner it can be started, the better the chances of getting the whole project under way without undue delay and lost motion.